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ABSTRACT

Arguing that the history of the field of educational technology has been one of glorious promises, many of them only partially fulfilled, this paper presents the premise that desktop publishing (DTP) is just another production fad that will have little lasting effect on the quality of education. Potential benefits of DTP are described as: (1) increased availability of higher quality printed learning materials for classroom use; (2) quick and easy modifications; (3) lower cost of production; (4) more exciting printed materials; (5) increased emphasis on visual communication; and (6) increased sales of computer hardware and software. The potentially detrimental effects are identified as badly-designed materials, duplication of effort, and costs of purchasing and maintaining the software/hardware. Both the current and the historical roles of educational technology in teaching are reviewed, and educators are urged to consider DTP in the context of past experiences with educational innovations. A 16-item reference list is provided. (RP)

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Desktop Publishing: A Sober Second Look at the Latest Local Production Fad

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The premise underlying this paper is a somewhat cynical one: Desktop publishing (DTP) is just another local production fad that will have little lasting effect on the quality of education, but will leave behind the (high quality print) equivalent of the 1000 different teacher-made transparencies of the human heart, slightly less affluent school boards, and enthusiastic teachers and professors who delude themselves into thinking that by doing DTP, they are doing important things for their students' education.

The 1000 transparencies to which I refer is a figurative notion I use to exemplify the results of educational technologists' efforts in the late sixties and early seventies (and still today, in many places) to imbue teachers with the wonders of local production of educational media. I must confess that I don't have empirical data to support the figure. Perhaps there aren't really 1000 transparencies of the human heart out there. Perhaps there are only 974. Or perhaps there are really 1119.

The point is, as a result of educational technologists' emphasis on local production, a lot of teacher time has gone into what can only be called redundant activity, re-producing what has already been done by someone else, somewhere else, frequently better. By promulgating the value of local production over the years, are we promulgating the re-expenditure (dare I say waste?) of teachers' time?

To be sure, it doesn't *feel* wasteful. The teachers feel good about it—many actually enjoy creating slides, transparencies, and the like, and hardly consider it work. School boards feel relatively good about it—their very own teachers are spending all this extra time after school and on weekends, preparing teaching materials, and it isn't costing the board a cent in overtime—just a few hundred dollars for materials and equipment. Educational technologists feel good about it—education professors' students give them lots of positive feedback about how nice it is to *finally* have a "practical" education course, and media specialists in the field are happy that their facilities are being used and that their gospel is being applied.

The only ones who may not be getting a good deal are the students! I will elaborate on that point later in this paper. However, let's pause now to review the potential of educational technology as identified over the past number of years.

♦ ♦ ♦

The history of the field of educational technology has been one of glorious promises, many of them unfulfilled, or at best, only partially fulfilled. Consider this statement:

> "I believe that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks. I should say that on the average we get about two percent efficiency out of schoolbooks

> as they are written today. The education of the future, as I see it, will be connected through the medium of the motion picture... where it should be possible to obtain one hundred percent efficiency."
>
> Thomas Edison
> (Source: Cuban, 1986)

One could easily substitute any one of the following words for "motion picture" and come up with a quotation that some educational technologist or another has probably made: radio, television, overhead projector, computer-assisted instruction, interactive video, audio or video teleconferencing, and (in Saskatchewan at least) either fiber optics or satellite transmission, depending upon the camp to which one belongs.

Of course, motion pictures have been around since before the turn of the century, and education is still waiting for the revolution. And for the 100% efficiency, in whatever form it ultimately arrives!

My point here is that educational technologists, as a group, have had a tendency to predict nearly-miraculous outcomes from the application of whatever technology happens to be in vogue at the moment. While I can't claim to have heard specific similar predictions about desktop publishing, there is a certain gleam that appears in the eyes of some of us when an exciting technical innovation comes along, and I think I've seen that gleam appear when DTP is mentioned.

My purpose, then, is to cause us all to take a long, hard, sober second look at desktop publishing, and evaluate its potential for improving education, before we begin to advocate its use too widely. In order to do so, we will first establish a common definition of the term 'desktop publishing' by describing its characteristics, and look at some of the benefits and drawbacks that come along as part of the package. Some of the more-or-less neutral outcomes (i.e., those that are neither good nor bad in and of themselves) will also be identified, then some rules of thumb will be developed to help us decide when DTP is and isn't a good idea. In order to complete our long, hard, sober second look, we will also touch briefly on the appropriate role of technology in the classroom, and take a step back for a macro view of some things the field of educational technology has and hasn't done over the past couple of decades. This will lead to a short sermon on the sins of technological evangelism and a re-examination of the statement I made earlier about how the student may not be benefitting from our promulgation of local production as a way for teachers to spend their professional time.

Characteristics of DTP

DTP is the child of two technologies, computing and printing. While some technical terminology is necessary to adequately describe DTP, I will attempt wherever possible to avoid the use of jargon particular to either technology. This may, unfortunately, result in the use of common words which those familiar

with one or both of the technologies will find simplistic or not sufficiently precise. To them, my apologies; it is done with the hope that the non-technical reader will be aided by their use.

DTP is characterized by some combination of the following elements of text production, created and manipulated on a microcomputer screen, and printed on a laser printer. Not all combinations of hardware and software that claim to be DTP systems offer all the following features, but generally, the more features offered, the more powerful the system.

- multiple columns of text per page, capable of justified right margins;
- ability to produce mirror image pages quickly and easily (e.g., create outside edge margins of a different size than binding margins, and maintain the relationship across even- and odd-numbered pages);
- intermixed graphics and text, with graphics or headline text capable of spanning more than one column of body text. The graphics may be line drawings, graphs, or digitized photographs or organizational logos;
- variety of typefaces available, in different sizes and styles (e.g., **bold**, *italic*, **outline**, underlined, SMALL CAPITALS, etc.);
- lines, rectangles, ovals, or other shapes to frame or separate text or graphic elements;
- areas filled with patterns, possibly with text overlaid;
- ability to rotate text and graphics on a page, or to rotate an entire page;
- high-quality printed output (at minimum, 300 lines per inch vertically and horizontally; up to 2540 lines per inch with some equipment);
- WYSIWYG ("what you see [on the screen] is what you get") layout:
  - on-screen positioning of elements (text blocks, graphics, headlines, photographs, borders, etc.)
  - "pouring" text into predefined areas, so that when the first designated space is completely filled with text, the excess text "spills over" into a second designated space
  - instantaneous resizing and/or reshaping of text areas or graphics
  - instantaneous changing of font, and style or size of text, for part or all of a text block.

What is Needed for DTP?

Desktop Publishing started out as a process that could be accomplished with only one combination of hardware and software: Apple's Macintosh computer and LaserWriter printer, and Aldus Corporation's PageMaker software. Indeed, the term DTP apparently originated at Aldus (Alsop, 1987, p. 111). It wasn't long before other software that did approximately the same job was available for use with the same hardware. More recently, the PC-DOS (IBM and clones) equivalents of DTP software have proliferated, and the capability to use laser printers other than Apple's has appeared (Alsop, 1987; Burns & Venit, 1987a, 1987b).

DTP has become such a popular sales gimmick that virtually any micro-computer company interested in marketing their products for business applications has to pay at least lip service to it. Furthermore, DTP concepts have begun to infiltrate more conventional software. This paper, for example, was produced on what is marketed as a word processing program. When the writing of the paper was first started, the only way some of the layout herein could have been accomplished was with PageMaker or an equivalent program specifically designed for DTP. By the time it was finished, a number of word processing programs offered some of the capabilities of DTP. (Of course, this may be as much a testimonial to the slowness of my writing as it is to the rapidity of adoption of DTP ideas!)

Potential Benefits of DTP

High Technical Quality for Print Materials

Foremost among the benefits of DTP is the potential for higher quality printed learning materials for use in the classroom. Lower costs and increased availability will mean that educators will have more ready access to professional-looking print materials. This is not a benefit to be minimized, as any student who has tried to read her teacher's illegible scrawl on classroom handouts or on overhead transparencies will attest. Now that an overhead transparency with proportionally spaced, 18-point bold Helvetica lettering is as easy to prepare as is a simple memorandum, improvements in this quarter should be forthcoming.

Quick and Easy Modifications

The ability to quickly and easily modify class handouts in whole or in part, and to see the modifications in WYSIWYG form on the screen, naturally encourages educators to give those handouts more consideration than they would if they had to use pre-DTP methods. Small changes in text or graphics would be considered viable only if hundreds or thousands of copies were required, prior to DTP; now, they can be so easily and inexpensively accomplished that errors and changes can be accommodated no matter what the press run.

Lower Cost of Production

With the ability to make quick and easy changes come cost savings. Whereas completely re-doing the typesetting for a publication would be an expensive proposition, with DTP it becomes almost trivial. It is now feasible to consider very small print runs (in the tens, rather than in the ten thousands) as economically viable. Of course, the printing costs will still be greater for the larger print runs, but the layout and typesetting costs, which used to have to be amortized over large print runs, now become a more minor consideration.

More Exciting Print Materials

The days of mundane typewritten teaching materials are limited. With the capability to add graphics and other visual embellishments, more attractive print materials can be produced. Capital letters and underlining no longer represent the limits of our ability to direct attention with text; now there are a variety of fonts, styles (bold, italics, outline, shadow, small caps), and sizes of text, and a growing library of electronic clip-art. The opportunity arises to make the Hawthorne Effect[1] work in our favour.

Increased Emphasis on Visual Communication

One of the effects of popularization of DTP will be the increased emphasis that will be placed on visual communication skills. Hitherto, only especially talented people could produce high quality graphics; even then, the incorporation of graphics into text materials was an expensive proposition, thus little-used. DTP does away with those barriers, and makes accessible to anyone—student and teacher alike—the capability to include graphics like graphs, line drawings, or digitized photographs, as appropriate for effective communication. Already, there are signs of growing interest in this area, with the appearance of pertinent articles in the popular press (e.g., see Spiegelman, 1987) and the creation of new periodicals devoted exclusively to DTP design (e.g., *Publish!*).

Increased Sales of Computer Hardware and Software

We cannot complete consideration of the benefits of DTP without looking at the benefits to the computer industry through increased sales. Of course, whether or not this benefit to the computer industry translates into a benefit for education is what this paper is all about.

[1] The so-called "Hawthorne Effect" refers to experimental findings that productivity increased in a factory setting in response to a change in the environment (e.g., lighting, temperature, etc.) regardless of what the change was.

On the surface, these would seem to be desirable effects, but a more careful examination of these points and some possible side-effects (below) may yield some surprises.

Potential Detrimental Effects of DTP

Badly-designed Materials

First and foremost, there is likely to be a plethora of badly-designed printed materials circulated and used in classrooms. Putting the ability to print "pretty" text in the hands of everyone does not in any way ensure that what will be printed will be worthwhile, no matter how "pretty" it is. Just as increased accessibility to photographic and video tools resulted in the production of many poor slides and videotapes (as well as a few good ones), so the increased accessibility to DTP will promulgate unworthy publications. (Please note that I am not referring solely to technical quality here; I am talking about instructional quality.) Putting it bluntly, DTP tools facilitate the production of bad text as much as they do good text. Once again, many educators will have to re-learn that good instructional design and good technical quality are very different things, and that the former is far more important than the latter.

Furthermore, what some people consider "pretty" is not necessarily instructionally effective. Rules of thumb developed by typographers may or may not be good ones for instructional materials. That there should be no more than two or (at most) three different fonts on a single page is one of the good rules that will likely be violated many times over by novices to DTP. (Even seasoned media production people have been known to succumb to the temptation to use highly decorative, albeit illegible, fonts for the production of overhead transparencies!) On the other hand, the industry standard of right-justifying text so that columns look "nice" is showing itself to be counter-productive in an educational setting, as it impairs legibility (Hartley & Burnhill, 1977; Hartley, 1978).

Duplication of Effort

Much redundancy and duplication of effort, for which local production is already too well known, is likely. As mentioned earlier, my caricature of the local production thrust that developed when the overhead projector was a "hot" item for instructional technologists is that in each province of this country there were at least 1,000 transparencies produced depicting the human heart. All of them were different, but all had the same instructional intent.

How much more useful it would have been if we had expended our energies on creating one good set of transparencies and duplicating them en masse (with attendant cost savings), rather than teaching the 1,000 teachers how to while away their spare time in a redun-

dant effort of local production. By continuing to foster such local production activity, are we not simply promulgating the labor-intensive nature of education?

My concern for the present and the immediate future is that many educators (and, especially, teacher educators) will once again fall into the trap of thinking that it is worthwhile to teach teachers how to use DTP tools for the espoused purpose of improving the education they provide our children, without regard for the efficiency of selecting existing materials or the necessity of employing sound principles of instructional design.

Costs

Costs are a tricky issue. On the one hand, the costs of hardware and software have fallen so quickly that now it is quite reasonable for a medium-sized school to consider acquiring the facility to do with DTP what would have been prohibitively expensive only five years ago. On the other hand, one has to ask the question about whether what is being contemplated is really being considered out of necessity for the resultant capacity to publish, or is merely a "jumping on the band-wagon", a "keeping up with the Joneses", or a knee-jerk reaction to the sudden affordability (i.e., there is no longer a cost reason not to do it, so let's do it).

In addition to the considerable costs of operating and maintaining the necessary equipment, there are other, hidden, costs associated with DTP. There is the cost of various users learning how to use the software and hardware. In so doing, they may be using time that might be put to better use on other teaching activities, but is being invested in DTP because it is fun and different (a lesson we should have learned from the local production of overhead transparencies era I mentioned above). There exists a fine line between the useful creation of enthusiasm that an innovation might bring to an individual's involvement in his or her job, and the over-reaction and evangelism that can also ensue.

Neutral Effects of DTP

Research on Text

There has been a recent spate of interest in the technology of text, and, along with it, a growing interest in researching its characteristics vis-à-vis instructional effectiveness (e.g., see Hartley & Burnhill, 1977; Hartley, 1978; Jonassen, 1982). All this is to the good: we need to know more about what kinds of text elements create what effects, even if it sometimes means challenging conventional wisdom, as in the case of right-justified margins.

It is interesting to note that this type of research has been underway for graphics for a considerable length of time (for recent sum-

maries, see Merrill & Bunderson, 1981; Levie & Lentz, 1982), but is only just recently getting underway for text. Educational technologists have hitherto adopted a more-or-less anti-text posture, emphasizing the auditory and the (non-text) visual; now the pendulum is apparently swinging back.

The Importance of Design

As already noted, educators are likely going to have to discover that attention to the design of the materials (in the sense of the instructional design as well as the graphic design) is more important to learning than is the technical quality of the print. The design process simply cannot be given short shrift without having adverse effects on the material produced. Education has no need of the print equivalents of "talking-head" television.

How and When Should DTP be Used?

Educational institutions at all levels should look seriously but cautiously at DTP. If (perhaps only if) they are already engaged in an enterprise that

- requires the intermixing of graphics and text
- needs editing from time to time to update
- has a *defensible* need for high quality text
- issues a template-type publication (i.e., a publication that has a more-or-less constant structure and layout, but content that changes from time to time)

then perhaps DTP is a reasonable technology in which to invest. They should *not* get into DTP simply because the fad exits and it seems like a "fun" thing to do, or do it to produce materials that will impress others. Of course, honest answers to the questions begged by the rules of thumb above must prevail.

Anyone considering involvement in DTP must be prepared to invest many person-hours in learning time, both in familiarization with the equipment and the software (both of which require considerable investment, with the software probably requiring at least as much time as the hardware) and with principles of graphic design, typography, and layout.

The Role of Educational Technology in Teaching

In the opening paragraphs of this paper I noted that education students and practicing teachers alike appear to believe that local production is a practical skill. What they fail to recognize, and what I think educational technologists as a group ought to take great pains to point out to them (and to school boards and society as a whole) is that the judgement of practicality is premised on their conceiving their roles as providers of information, as delivery vehicles of content.

If there is anything that the field of education technology has demonstrated through research over many, many years, it is this: Technology can deliver content at least as well as teachers can. From the scores of studies of motion picture films done in the early fifties (Hoban and Van Ormer, 1954), the six-hundred-odd television-vs.-teacher comparison studies showing essentially, no significant difference (Chu & Schramm, 1967), the intensive evaluation of the use of television lessons broadcast to millions of students from a DC-3 flying over the American Midwest (Fritz, 1963), to the repetitive demonstrations that computer-assisted instruction is a cost-effective method of teaching a variety of subjects (e.g., see Edwards, Norton, Taylor, Weiss, & Dusseldorp, 1975), the evidence is as overwhelming as it is consistent: media can teach students content.

What then, might the function of teachers be? Some bold and apparently visionary educational technologists have had the temerity to suggest that teachers will be displaced by machines, especially by computers. (Even Edison didn't dare go that far—he was merely going to replace textbooks with motion pictures!)

Fortunately, school boards and society as a whole have chosen so far not to follow that advice—with good reason, I think. It's not that it couldn't be done, that computers couldn't do a good job of teaching all the different subject matter that teachers do, although that is frequently the first excuse offered. I firmly believe that this country has the necessary expertise and imagination, and if the political will was evident, we could probably accomplish the goal of replacing all teachers with machines in as little as ten years. I must also say that I hope we don't do that. Humanity in the teaching-learning relationship is an absolute essential. But that does not mean that the human should be doing tasks (such as delivering content) that a machine can do at least as well.

My argument is not new. Consider these statements, now nearly 20 years old:

> The era that is in full bloom and is about to fade is human-to-human instruction...
>
> The era of instruction that will supersede the era of human-based instruction is to be one of man-machine interaction. And the machine is the computer...
>
> The computer offers an intense learning environment. But it does not offer an intense *human* environment...
>
> An important focal point for the teaching profession now is the humanization of the means of instruction...
>
> I do not see the computer as the human teacher's competitor. Not at all! I see it rather as replacing the teacher for many instructional tasks which the computer should do and, indeed, can do better...
>
> I submit that the computer can and will do certain instructional tasks better than any human teacher can perform them. The research challenge is to catalogue those aspects of

> instruction that are most appropriate for the machine teacher, on one hand, and for the human teacher, on the other...
>
> (Goodlad, 1968, p. 6-10)

Why has so little happened in the past 20-odd years to accomplish the goal of having machines and humans working side by side in the classroom? Despite the much wider availability of affordable hardware and software, computers in education are still being used primarily in what Fritz (1963) called a supplementary role, rather than in a complementary role, especially at the high school level (see Becker, 1987).

I think a major portion of the blame has to fall upon the shoulders of educational technologists, and in particular those of us who are engaged in the preparation of teachers. I think it is our failure to accept our own principles and work with them to evolve new forms of classroom activity. We prefer to focus our attention of our "gadgets" – a charge levelled against us many times by non-technologists, and one to which we are all sensitive. But isn't there a grain of truth in the charge?

Shouldn't we be spending more of our time helping to work out the new role of the teacher in a high-tech classroom? (I think it would be rather small of us to adopt the attitude that we have paved the way for the classroom of the future by doing our half– providing the technology capable of delivering content; now it's time for someone else to invent the other half– how humans should be deployed and employed most effectively.)

If teachers could be freed from the routine of presenting information to students, and if they could be taught (through both pre-service and in-service education) what they should be doing with their time instead of dispensing content, I believe the students would benefit a great deal. Therein lies the real problem, I suspect: Teachers do what they do because they are, by and large, conscientious, and would feel guilty doing nothing, but they haven't been taught what they should be doing instead of presenting content. Indeed, teacher educators probably don't even know what teachers should be doing instead of presenting content. But it's high time they invested some energy into finding out. We do know what teachers *shouldn't* be doing, however; Goodlad (1968) put it this way: "We must *not* make the human teacher a supervisor or coordinator of the computer or he will become its servant (p. 10)." Despite Goodlad's admonition, we seem to be well on our way toward training teachers to fill that role. Teachers in most schools that use computers, particularly at the elementary level, end up supervising, coordinating, and trouble-shooting computer use, rather than doing more professionally-demanding tasks. We can blame the teachers for their inappropriate behavior, but less so than we can blame *their* teachers: teachers are only doing in their classrooms what they were taught to do, be it explicitly, or by example.

The radical teacher-in-the-classroom role change necessary to effect *real* changes in our educational system are going to require sustained, concerted effort. As Natman (1987) points out,

> ...right now, teachers want programs that don't require substantial changes in the way they teach. They feel they know

> how to teach their subjects. They spend their days running the classroom, their nights correcting papers or preparing lesson plans, and their summers working in special programs (p. 196).

What we face is not a technical problem, it is a problem involving changes in human behavior, and thus it is truly a *technological* problem. For many years, the lack of affordable hardware and software was our scapegoat; now that the technology has more or less arrived, we must begin to face up to the associated problems of changing teachers' behavior. Educational technologists, who have always prided themselves on being (nominally, at least) change agents, must devote their share of attention to those problems.

Obviously, I don't have many answers on this issue; no-one does. All I am attempting to do is to convince you that as a educational technologist, you should make a sincere and sustained effort to apply the knowledge we have gained from research on educational technology in a socially acceptable way. The path to the kind of change that this country must effect in its educational system during the next decade, at most, if it is to survive at even our current, somewhat depressed, standard of living in a knowledge-based economy is not through teaching teachers how to "do it yourself" with media, be it transparencies, DTP, or CAL. If this means working with your colleagues to help define new roles for teachers in the classroom, then so be it. It doesn't have anything to do with exciting hardware, but it does have to do with technology in the broadest sense of the word: how things are done. Therein lies the challenge of the future.

> ***Simply to say that the advent of the computer will leave the more sensitive and significant teaching tasks to human teachers is not enough. The process of humanizing instruction will not occur by chance.***
>
> (Goodlad, 1968, p. 10)

♦ ♦ ♦

To return to the major topic of this paper: In summary, it should be noted that none of the potential disadvantages of DTP, in and of themselves, or even in combination, is sufficiently serious to argue *against* the use of DTP in education. Hopefully, however, instructional technologists learn from their past actions and use that learning to guide their future actions. Thus the potential negative outcomes of DTP described earlier should serve as warnings of what might happen if we don't take care to circumvent them.

As educational technologists, we have a responsibility to be informed about and to disseminate information and knowledge about valid technologies of potential use to education. A problem arises when we have to make a judgment about *when* a technology proves itself to be efficient and cost-effective enough to be considered a legitimate and viable alternative for application. There is a natural human tendency to want to be associated with the "in-group", and today the "in-group" is unquestionably steeped in what is often called "hi-tech".

However, we must always be careful that we don't stretch the bounds of our credibility. Education is a conservative and traditional institution, and if we go around year after year introducing its members to the latest technology that will (finally!) revolutionize– and possibly even save– education, we will quickly be categorized as crying wolf. That would be beneficial to neither ourselves as educational technologists nor to the institution of Education.

I hope none of you will take my provocative remarks about DTP and the role of local production in teacher education as personal indictments– they were most certainly not intended that way. I cannot afford to cast the first stone: Throughout my career, I too have done my share of proselytizing on behalf of such educational "miracles" as television, CAI, and even the virtues of locally-produced overhead transparencies. And does anyone remember that great Canadian invention called Telidon?

One of the great benefits of having a large brain is that it gives us humans a better opportunity than that given lesser animals to learn from experience. Whether it is experience that is influencing my outlook on innovations such as DTP, or something else, I find myself casting an increasingly jaundiced eye on educational "miracles", because in the end, I doubt they will have as much influence on education as some of their promoters claim. I urge you all to give both DTP and other educational innovations very sober second looks.

Watch out– here come CD-ROM's.

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